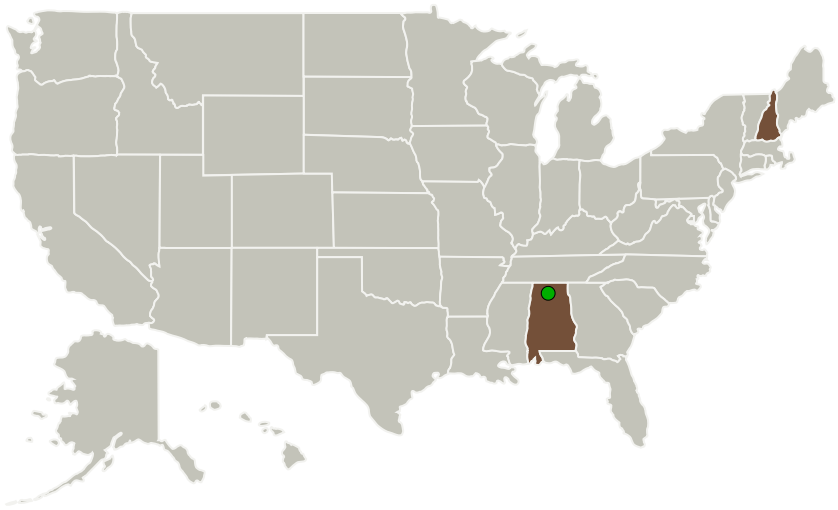
Compact Vacuum Pump for Titan Lander Missions, Phase II

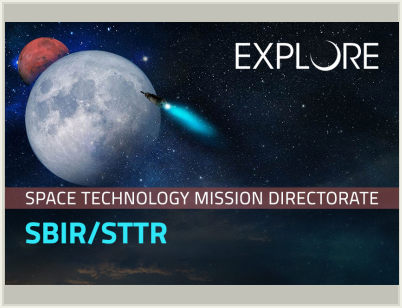
Completed Technology Project (2011 - 2014)

Project Introduction

For a number of years Creare has developed, fabricated, and tested highly miniaturized, high vacuum pumps specifically designed for mass spectrometers used on NASA Mars missions. These pumps would also be useful on other missions to planets and satellites with atmosphere, such as Titan, as well as terrestrial applications on Earth. In order to allow these high vacuum pumps to operate in high-pressure environments such as exist on Titan and Earth, the vacuum pump needs to be supplemented with a rough pump that can take its exhaust and compress it to 1–1.5 atm. This project aims to design, fabricate, test, and deliver such a compact vacuum pump system that can generate a high vacuum, on the order of 1e-8 torr, and exhaust directly to an Earth or Titan atmosphere. The pump will be assembled in a very compact, robust, and low-power package. Our Phase I project clearly demonstrated the feasibility of our innovative design by demonstrating the performance of a rough pump and designing a compact vacuum system for use on Earth or other planetary bodies with atmospheric pressure greater than 1 atm. During Phase II of this project, we will build a complete benchtop pumping system that meets the requirements.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	New Hampshire

Project Transitions

June 2011: Project Start

June 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138762)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Creare LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul H Sorensen

Co-Investigator:

Paul Sorensen

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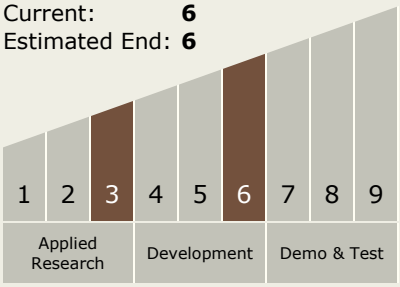
Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System